

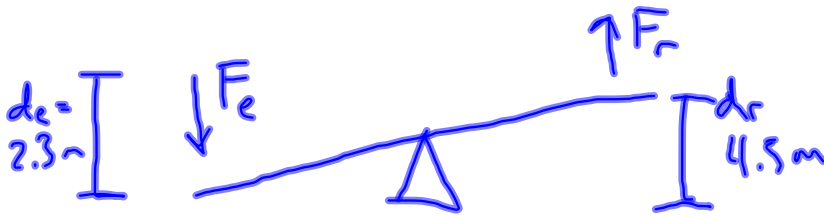
TEST Thursday, 11/3

## Simple Machine Notes and Practice Problems 1st Block 10.31.311

A certain seesaw-like device is constructed so that one side is pushed downward over 2.30 m, the other side is lifted 4.50 m. Draw and label this machine.

a) What is the IMA of this machine?

b) If this machine is 70.0% efficient, what is the AMA?



$$a) \quad IMA = \frac{d_e}{d_r} = \frac{2.3 \text{ m}}{4.5 \text{ m}} = 0.51$$

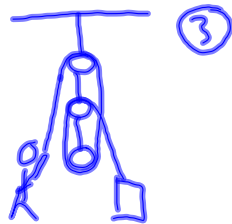
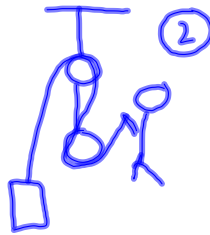
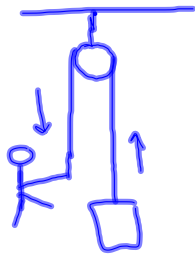
$$b) \quad Eff = \frac{AMA}{IMA} (100\%)$$

$$AMA = \frac{(Eff)(IMA)}{(100\%)}$$

$$= \frac{(70\%)(.51)}{(100\%)}$$

$$= .358$$

## Pulleys:



Activity Results: When increasing the number of pulleys,

-  $F_e$ ? Increased

-  $d_e$ ? Decreased

- IMA? No pattern

- AMA? Decreased

- Efficiency? Decreased (some no pattern)

} Not what we expected..

} Interesting

• IMA = # pulleys

## Simple Machine Notes and Practice Problems 1st Block 10.31.311

You must pull a rope connected to a pulley a distance of 6.99 m to accomplish a certain task. If this simple machine is 85.8% efficient, with how much force will you have to pull down to have the machine do 444 J of work for you?

$$\begin{aligned}d_e &= 6.99 \text{ m} & \text{IMA} &= \frac{d_e}{d_r} & \text{Eff} &= \left( \frac{\text{Work out}}{\text{Work in}} \right) (100\%) \\ \text{Eff.} &= 85.8\% & \text{AMA} &= \frac{F_r}{F_e} & &= \left( \frac{\text{AMA}}{\text{IMA}} \right) (100\%) \\ W_o &= 444 \text{ J} \\ F_e &= ?\end{aligned}$$

$$\left( \frac{\text{work out}}{\text{work in}} \right) (100\%) = \left( \frac{\text{AMA}}{\text{IMA}} \right) (100\%) = 85.8\%$$

$$\frac{W_o}{W_i} = \frac{\text{AMA}}{\text{IMA}} = .858$$

$$\frac{W_o}{W_i} = \frac{\frac{F_r}{F_e}}{\frac{d_e}{d_r}} = .858$$

$$\frac{W_o}{W_i} = \frac{F_r d_r}{F_e d_e} = .858 \quad \text{① } W_o = F_r d_r$$

$$\frac{W_o}{F_e d_e} = .858$$

$$\begin{aligned}F_e &= \frac{W_o}{(.858) d_e} \\ &= \frac{444 \text{ J}}{(.858)(6.99 \text{ m})} \\ &= 74.0 \text{ N}\end{aligned}$$

An armadillo bites and pulls down with a force of 40.4 N as he tugs a rope in a pulley system over a distance of .650 m. As a result, a 3.55 kg basket full of rocks lifts .250 m.

- a) Calculate the AMA of the system.
- b) Calculate the IMA of the system.
- c) How efficient is this simple machine?